CLIMATE-SMART HEALTHCARE: WHAT DOES IT ENTAIL?

Josh Karliner and Shriram Manogaran

Introduction

Any health system's primary focus is to improve population health and respond to disease. In order to achieve this, a successful health system must prepare and build resilience to climate and other disruptive events (Karliner *et al.*, 2020). "Climate-smart" is a collective term used for measures that build resilience to climate change while also reducing greenhouse gas emissions. Working on only one of these two measures may yield short-term gains, but will not suffice for a comprehensive healthcare effort to address climate change. The health sector needs to explore opportunities for climate resilience in order to be functional during extreme climate events while adopting low carbon models of care to reduce its own footprint. Hence, a low-carbon *and* resilient health system can be referred to as climate-smart healthcare (Timothy, Roschnik and Karliner, 2017). This chapter delves into the importance of both these aspects, and provides insight on the following:

1. How to build a resilient health system that can adapt to climate threats.
2. What mitigation strategies can be adopted by a health system in order to decarbonise.

Resilient health systems

Building health-system resilience to climate change is a cumulative process that occurs over the short-, medium- and long term. It entails various tasks such as capacity building, monitoring and evaluation, climate-related communications, responding to and managing uncertainty, and learning from prior experiences.

According to the World Health Organization, a climate-resilient health system is one that is capable of anticipating, responding to, coping with, recovering from and adapting to climate-related shocks and stress, so as to bring sustained improvements in population health despite an unstable climate (WHO, 2008, 2015). This is essential in order to deal with rising

Figure 12.1 Climate resilience and environmental sustainability in healthcare facilities (Reproduced with written permission from WHO (2020), WHO Guidance for Climate Resilience and Environmentally Sustainable Healthcare Facilities, Geneva).

population pressures, environmental degradation and emerging infectious disease outbreaks, such as Ebola and COVID-19, which has highlighted the failures and insufficiency of adaptation measures in health systems around the world.

The WHO operational framework (see Figure 12.1) contains components that elaborate on the building blocks of a resilient health system and its relationship to environmentally sustainable healthcare facilities [WHO, 2020).

Building resilience is the first step in protecting health systems from the complex, unpredictable, and multifaceted ways in which climate change affects healthcare delivery and infrastructure. This is why climate change should be acknowledged as a health issue, and why climate responses should position health as a cross-cutting theme for overall adaptation. Building awareness within the health community on the relationship between climate change and health with both policy and practice will see more well-developed resilience and mitigation systems (WHO 2008, 2015; Costello *et al.*, 2009). The following considerations are essential for integrating climate perspectives into health policy and operations:

Identify and reduce vulnerabilities

The first step is to identify specific issues within the health system and infrastructure. A generalised risk from extreme climate events is insufficient for planning. This is because not all areas are equally at risk within a state or even within a district. The intensity, frequency and duration of local climate

events should be assessed and factored into design and execution (Resilient Hospital Dashboard¹, 2016). A vulnerability assessment should be conducted for the infrastructure and for the community. Potential avenues for collaboration should be initiated with national and local meteorological services with access to local climate vulnerabilities and their assessments (Timothy, Roschnik and Karliner, 2017). Once the local short-term and long-term vulnerabilities of the health system are completely understood, investments should be made available to strengthen weak areas and mitigate the vulnerabilities. Particular importance should be given to human resources and equipment; an adequate workforce and climate-proofed infrastructure at the local level can help control climate-induced disease outbreaks and improve responses to local emergencies such as floods, heat and cold waves. These events not only disrupt health services but also hinder the supply of safe water, sanitation and electricity to health facilities. Thus, possible backup options need to be explored. For instance, installing solar panels or wind turbines and microgrids for energy storage can provide a locally-controlled energy supply that can help ensure the continuity of services during an emergency and would also contribute to reducing a facility's carbon emissions.

Build and diversify capacities

Awareness generation and capacity building workshops should be held for healthcare practitioners and managers, with progressive steps being made to understand the impact of climate change on health and to evaluate the effectiveness of their interventions (WHO, 2015). The healthcare workforce needs to be sensitised to the global impacts of climate change and what it means locally to their communities (Fox *et al.*, 2019). This will result in public health and climate research capacities attuned to climate realities and projections. Investing in the continued engagement of staff at all levels of healthcare on climate-related issues will aid in developing local (district-level) plans that reflect local priorities for responding to climate change (Walsh, 2013). The impact of climate change on healthcare is a new sub-field of research. Thus, health professionals need to come forward to assist and collaborate in new research studies for a better understanding of trends in the interplay of health and climate change. A nexus of informed health practitioners can also play a key role in policy dialogues, invite new avenues for the financing of climate and health research, and facilitate the transition of the health sector to a climate-smart future (Timothy, Roschnik and Karliner, 2017).

Develop adaptive management approaches

An adaptive management process is required while handling a complex and uncertain issue like climate change. An iterative process of decision-making

and implementation is vital in this context. In general, the use of tools, assessments, approaches, feedback and new information for decision-making facilitates adaptive management. For example:

- a vulnerability assessment clarifies the scale of local needs
- a staff and partners' survey provides insight on effectiveness
- monitoring identifies any changes in conditions
- the evaluation of performance and failure under different conditions identifies limitations
- pre-testing or piloting small initiatives can improve processes before scaling up

Use community action to strengthen health systems

Community action is critical in order to achieve climate-resilience. Many countries have outlined community approaches as National Determined Contributions (NDCs) and National Adaptation Plans (NAPs) for implementing the Paris Agreement on climate change (Fransen et al., 2015; PEER, 2009). Several impacts of climate change manifest at the local level. Thus, partnerships between healthcare facilities and systems with local communities and civil society are crucial in order to address local risks and vulnerability. These partnerships can promote both community health and climate resilience. Successful resilient health systems are built through practices that take climate change into consideration while empowering communities (Box 12.1).

Mitigation strategies for the health sector

While they may differ in scale, all health facilities release greenhouse gases while delivering care and procuring products and technologies from a carbon-intensive supply chain. The health sector contributes to carbon emissions through energy consumption, transport and products manufactured, used and disposed of. These emissions can be understood and divided in accordance with the Greenhouse Gas Protocol framework (GHG Protocol, 2017) into Scope 1 (direct emissions from healthcare facilities), Scope 2 (indirect emissions from purchased energy) and Scope 3 (all indirect emissions, not included in scope 2, that occur in the value chain, including both upstream and downstream emissions) – see Figure 12.2. Although India has the seventh-largest absolute health sector climate footprint in the world, it has low healthcare emissions per capita (Timothy, Roschnik and Karliner, 2017).

As hospitals and health systems explore opportunities to address climate change, they find significant overlap and synergies between mitigation measures and climate change resilience interventions. Many resilience strategies also contribute to climate mitigation and vice

Box 12.1 Case study**An analysis of health systems after the 2018 floods in Kerala, India**

An analysis of the hospital site locations and non-structural vulnerabilities resulted in the following recommendations to improve building resilience to flooding from climate change:

- Hospital construction and remodelling should take into account the topography, flood history and climate of the region while planning the building.
- Assessments should be conducted in consultation with the public to map vulnerabilities and diseases, determine the need for specific medicines and plan and provide for these medicines.
- Sufficient power backup, water supply, food and medicines should be provided for within hospitals in case of emergencies.
- Hospital equipment should be relocated to higher floors, either permanently or at least during floods.
- Critical backup power supplies and building infrastructure (electrical power, heating and cooling, drinking water, waste systems) should be located above historical or anticipated flood levels.
- Patient medical records should be stored in a flood safe area.

Source: Sambath, 2019

versa—for example, siting health facilities with access to public transportation, deploying on-site energy generation (including solar and other renewable sources), combined heat and power, buildings with natural ventilation, purchasing energy-efficient medical devices and changes in health delivery (such as telemedicine), contribute to both system resilience and carbon footprint reduction.

Many of these strategies can yield significant operational cost savings as well as facility resilience, such as in the case of short-term grid energy loss. For instance, hospitals are finding that interventions that enable them to reduce their dependence on large power grids and infrastructure also enable them to better withstand situations such as increased storms that disable centralised infrastructure.

Several international institutions have begun to orient themselves in the direction of de-carbonisation. The WHO has called for health systems to “lead by example, advancing models of low-carbon health care” (WHO, 2016). The Lancet Commission on Health and Climate Change has suggested that the health sector can take action in three key areas: mitigation,

India

Figure 12.2 India's healthcare footprint split by GHG protocol scopes.

Source: Reproduced with permission from Karliner, J., Slotterback, S., Boyd, R., Ashby, B., & Steele, K. (2020). Health care's climate footprint: The health sector contribution and opportunities for action. *European Journal of Public Health*, 30 (Issue Supplement_5), September 2020, ckaa165.843, doi: 10.1093/eurpub/ckaa165.843

resilience and leadership (Watts *et al.*, 2015). The World Bank Climate-Smart Healthcare report lays out a roadmap that says “designing, building, operating, and investing in health systems and facilities that generate minimal amounts of greenhouse gases... aligning health development and delivery with global climate goals... in low-resource, energy-poor settings, powering healthcare with low-carbon solutions can enhance access to care” (Timothy, Roschnik and Karliner, 2017).

Several health systems in multiple countries are already on the road to de-carbonisation, serving as models for the sector by implementing a set of actions to reduce their carbon footprint or become carbon-neutral in Scope 1 and 2 emissions, while also building resiliency (GGHH Case Studies, 2015). The transition to low-carbon or de-carbonised healthcare will necessarily include redirecting the health sector's purchasing power toward low-carbon energy sources and technologies to address Scope 3 emissions. In this way, health systems can move their own sector's massive supply chain, thereby also influencing broader markets and policy, and helping accelerate the transition to clean, renewable energy and a low-carbon future (Box 12.2).

Climate-smart healthcare can also foster more equitable access to healthcare and contribute to the development of sustainable, resilient, healthier

Box 12.2 Case study**Solar power for public health centres – Chhattisgarh, India**

The Chhattisgarh National Health Mission (NHM), India, was aware of the severe limitations in the delivery of dependable health-care resulting from the lack of reliable electricity; one-third of the public health centres in Chhattisgarh are either un-electrified or without regular power supply. NHM became aware of the Chhattisgarh Renewable Energy Development Agency (CREDA), which works to provide electrification via solar PV power systems. They fostered a collaboration whereby NHM would identify health centres that would benefit most from the decentralised electricity, and CREDA would be responsible for the full system development, installation, operation and management via local contractors. A pilot programme began in 2008. Its success has led to the installation of more than 900 PV power systems since 2011, all of which are still operational.

Source: Porcaro, Severi and McGregor, 2019

communities. A range of mitigation measures for reducing emissions from healthcare are summarised in Table 12.1.

Key takeaways

- In order to strengthen its defence, the healthcare community needs to become climate-smart, that is, build resilience to prepare against climate threats while reducing its own carbon footprint.
- To become resilient and adapt to climate threats, health systems should reduce vulnerabilities and build capacities by using adaptive approaches and community action.
- To reduce its carbon footprint and support environmental change in the long run, health systems can adopt mitigation measures during delivery of care, during procurement from a carbon-intensive supply chain, during energy consumption and transport, and through products manufactured, used and disposed of.
- In a climate-smart approach, there can often be overlap and synergy between mitigation and resilience measures.
- A climate-smart approach can also be cost-effective by yielding significant operational cost savings, and can also lead to more equitable access to healthcare.

Table 12.1 Mitigating strategies applicable to the health sector [Reproduced with permission from B. Timothy, S. Roschnik and J. Karliner (2017), *Climate-Smart Healthcare: Low-Carbon and Resilience Strategies for the Health Sector*, World Bank Group, Washington DC]

<i>Strategy</i>	<i>Actions</i>	<i>GHG impact</i>	<i>Benefits</i>
Improve energy supply and distribution efficiency	<ul style="list-style-type: none"> • Fuel switching • Energy recovery • Distributed generation • Combined heat and power 	<ul style="list-style-type: none"> • Reduced transmission losses • Reduced emissions from energy use, fuel production and transport 	<ul style="list-style-type: none"> • Immediate energy savings and operational resilience/ reliability • Reduced air pollution exposure • Improved access to reliable healthcare • Better energy security
On-site renewable energy sources	<ul style="list-style-type: none"> • Solar photovoltaics • Thermal solar energy • Wind • Other renewable energy sources 	<ul style="list-style-type: none"> • Reduced emissions from energy use, fuel production, and transport 	<ul style="list-style-type: none"> • Improved operational resilience/reliability • Long-term energy savings • Reduced ambient air pollution • Better energy security
Reduced-energy devices	<ul style="list-style-type: none"> • Non-electric medical devices • Direct-current devices • Energy efficient appliances 	<ul style="list-style-type: none"> • Reduced emissions from energy use, fuel production and transport 	<ul style="list-style-type: none"> • Energy and operations savings and energy security • Device reliability and improved functionality at night • Improved diagnosis of tuberculosis with low-energy LED microscopes • Increased access to healthcare and energy security
Passive cooling, heating, and ventilation strategies	<ul style="list-style-type: none"> • Natural ventilation in healthcare settings • Evaporative cooling • Desiccant dehumidification • Underground earth-pipe • Cooling 	<ul style="list-style-type: none"> • Reduced direct emissions from on-site energy production; reduced emissions from energy use, fuel production, and transport 	<ul style="list-style-type: none"> • Energy and operations savings and energy security • Improved indoor air quality • Decreased transmission of airborne infections • Improved social welfare, productivity and patient health

(Continued)

Table 12.1 (Continued)

<i>Strategy</i>	<i>Actions</i>	<i>GHG impact</i>	<i>Benefits</i>
Facility wastewater and solid waste management	<ul style="list-style-type: none"> • Advanced autoclaving of infectious healthcare waste • On-site wastewater pre-treatment and sanitation improvements • High-heat incineration of pharmaceuticals with pollution scrubbers 	<ul style="list-style-type: none"> • Reduced energy emissions for waste and water treatment • Reduced greenhouse gas (GHG) footprint from waste treatment processes in some settings • Reduced aquifer and ecosystem damage 	<ul style="list-style-type: none"> • Savings in waste/water disposal fees • Reduced waste volumes • Improved compliance with local air quality regulations/ guidelines • Improved hygiene around facility • Reduced methane and other emissions • Reduced risks of exposure to infectious agents and to diarrhoea and other waterborne diseases
Reduced GHG emissions from anaesthesia gas use and disposal	<ul style="list-style-type: none"> • Waste anaesthetic gas recapture and scavenging 	<ul style="list-style-type: none"> • Reduced direct emissions from anaesthesia gas waste 	<ul style="list-style-type: none"> • Anaesthesia cost savings with reuse • Reduced health risks for health workers exposed to gas • Improved health worker productivity
Reduced procurement carbon footprint	<ul style="list-style-type: none"> • Better-managed procurement of pharmaceuticals, medical devices, business products and services, food/catering, and other facility inputs 	<ul style="list-style-type: none"> • Reduced energy footprint in production and transport of unused pharmaceuticals and products 	<ul style="list-style-type: none"> • Resource savings on unused/wasted products • Reduced risks from use of outdated/expired products
Telehealth/ Telemedicine	<ul style="list-style-type: none"> • Home patient tele monitoring and guidance • Emergency response • Health worker advice and collaboration via mobile phones 	<ul style="list-style-type: none"> • Reduced emissions from healthcare-related travel 	<ul style="list-style-type: none"> • More cost-effective healthcare • Reduced risk of travel-related injuries • Improved management of chronic conditions, such as diabetes and heart disease, as well as emergency response • Better access to healthcare advice in poorly-resourced remote locations

(Continued)

Table 12.1 (Continued)

<i>Strategy</i>	<i>Actions</i>	<i>GHG impact</i>	<i>Benefits</i>
Health facilities in proximity to public transport and safe walking/ cycling	<ul style="list-style-type: none"> • Public transport options mapped during planning of buildings to locate new facilities nearby • Employee incentives for public active transport use & facilities 	<ul style="list-style-type: none"> • Reduced transport-related emissions from health worker and hospital visitor travel 	<ul style="list-style-type: none"> • Reduced traffic injury risk for health workers and hospital/ clinic visitors travelling to health facilities • Potential for active transport by healthcare workers to reduce risks of hypertension, cardiac disease and diabetes • Improved facility access for health workers and visitors who do not have cars
Conserve and maintain water resources	<ul style="list-style-type: none"> • Water-efficient fixtures, leakage management, water safety • Onsite water treatment and safe water storage in health facilities • Rainwater harvesting, greywater recapture/ recycling 	<ul style="list-style-type: none"> • Reduced energy use for water extraction from surface/ aquifer sources, therefore lower emissions • Reduced truck transit of water resources 	<ul style="list-style-type: none"> • Improved performance due to better access to safe water • Savings in water fees • Reduced water contamination from health facility activities • Reduced disease transmission from unsafe water and drinking water • Improved access to safe, potable water in poorly resourced health facilities • Reduced aquifer and ecosystem damage • Better water security

Note

- 1 The Resilient Hospital Dashboard is a USA-focused “interactive platform that enables healthcare networks to identify hotspots, key drivers of risk, and the specific local impacts faced by each of their hospitals. By using climate, socioeconomic, public health and facility specific data, these dashboards analytics help hospitals understand the impact of climate change on their community and patients.”

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